

# DEVELOPING INDEPENDENCE IN PRE-TRANSITION STUDENTS THROUGH HYBRID LEARNING ENVIRONMENTS

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## BACKGROUND AND AIMS

Increasingly, students enter science degree courses with inadequate science backgrounds (Rice, Thomas, O'Toole, & Pannizon, 2009), and poor preparation for deeper investigative learning in tertiary study (Beasley & Pearson, 1999). Intensive bridging courses run prior to first-year courses can help to address these problems (Read, George, Masters, & King, 2004). While bridging course participants exhibited increased confidence levels and assessment performance compared to students with no background (Youl et al., 2005), the impact of such courses should extend beyond building content knowledge, since it is crucial that students are inducted into the university environment and learning culture (Briggs, Clark, & Hall, 2012). Our challenge was to design a bridging course, which integrated independent learning, biology conceptual understanding and competencies, as part of an authentic university experience.

## DESIGN

An initial comparison of the senior secondary biology syllabus and the first-year biology curricula identified key concepts students needed to establish (Mitchell & de Jong, 1994). A five-day curriculum was then designed to expose students to active learning of core competencies such as experimental design and laboratory techniques, and the key concepts of cell biology, genetics, evolution, and organismal biology. Workshops and practicals were designed around constructivism and experiential learning (Driver, Asoko, Leach, Scott, & Mortimer, 1994; Kolb & Kolb, 2005) to provide opportunities for guided open inquiry. Complementary lectures were a mixture of interactive and didactic, for exposure to authentic university experiences. Students designed concept maps of bioenergetics and subcellular components using web-based *draw.io* software, built *Prezi* summaries to demonstrate multiple scales of genetics, tested evolutionary hypotheses with simulation software *NetLogo* (Wilensky, 1999), and created slowmotion videos (Hoban & Nielsen, 2013) to explain inheritance. They explored the campus to find laboratory samples, and worked through contextualised experiments to solve a family tree mystery, to design an experiment on the effects of salinity, and to visualise their own cells. Small teams collaborated on interactive tasks and scored points for activities ranging from capturing unique images of microorganisms to generating animations of cell division, and this gamified achievement system maintained motivation in the absence of formal assessment (Broussard & Machtmes, 2012). In addition, use of a workbook and the course website, delivered via *CourseSites.com*, mirrored the university online learning experience.

## RESULTS AND EVALUATION

Bridging course students had no senior high school biology experience and at the end of the course self-reported an average of 40% increase in conceptual understanding. They also indicated that course activities were intellectually stimulating (87% agreement), and that teamwork aided their learning (80% agreement). Qualitative comments highlighted consolidation and application of knowledge in workshops and practicals, and increased comfort with university learning styles. Preliminary data from semester 1 biology courses suggest that these students outperformed students with no biology background in three key examinations.

## CONCLUSIONS

Our student-centred course applied a range of pedagogical approaches and novel integration of technological tools, to help students build a deep understanding of core biological concepts and competencies while exposing them to authentic university experiences.

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